

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 103977 TL	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/FI2003/000303	International filing date (day/month/year) 16.04.2003	Priority date (day/month/year) 19.04.2002
International Patent Classification (IPC) or national classification and IPC F02M 25/028		
Applicant Marioff Corporation OY et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. (*sent to the applicant and to the International Bureau*) a total of 3 sheets, as follows:

sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. (*sent to the International Bureau only*) a total of (indicate type and number of electronic carrier(s))
_____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I Basis of the report
<input type="checkbox"/>	Box No. II Priority
<input type="checkbox"/>	Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI Certain documents cited
<input type="checkbox"/>	Box No. VII Certain defects in the international application
<input type="checkbox"/>	Box No. VIII Certain observations on the international application

Date of submission of the demand 10.11.2003	Date of completion of this report 27.05.2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Dan Ionesco / JA A Telephone No. +46 8 782 25 00

Form PCT/IPEA/409 (cover sheet) (January 2004)

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI2003/000303

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on a translation from the original language into the following language _____ which is the language of a translation furnished for the purposes of:

- international search (under Rules 12.3 and 23.1(b))
 publication of the international application (under Rule 12.4)
 international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

the international application as originally filed/furnished

the description:

pages 1 - 16 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

the claims:

pages _____ as originally filed/furnished

pages* _____ as amended (together with any statement) under Article 19

pages* 17 - 19 received by this Authority on 16.04.2004

pages* _____ received by this Authority on _____

the drawings:

pages 1 - 5 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. The amendments have resulted in the cancellation of:

the description, pages _____

the claims, Nos. _____

the drawings, sheets/figs _____

the sequence listing (specify): _____

any table(s) related to the sequence listing (specify): _____

4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

the description, pages _____

the claims, Nos. _____

the drawings, sheets/figs _____

the sequence listing (specify): _____

any table(s) related to the sequence listing (specify): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI2003/000303

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1 - 17</u>	YES
	Claims	_____	NO
Inventive step (IS)	Claims	<u>1 - 17</u>	YES
	Claims	_____	NO
Industrial applicability (IA)	Claims	<u>1 - 17</u>	YES
	Claims	_____	NO

2. Citations and explanations (Rule 70.7)

Amended claims have been submitted.

The documents cited in the International Search Report represent the prior art. The claimed invention stated in claims 1 - 17 is not anticipated by these documents. None of the documents or any relevant combination of them reveals a water spraying system as described by these claims.

According to the arguments stated above, the invention claimed in claims 1 - 17 is novel and considered to involve an inventive step. The industrial applicability of the claimed invention is obvious.

Claims

1. Water spraying system, especially for the humidification of the intake air of a piston engine to reduce nitrogen oxide emissions, said system comprising at least one nozzle (9, 10, 11, 12, 13) for spraying an aqueous liquid mist into the air intake duct (2) and means for conveying the liquid to be sprayed to the nozzle, characterized in that the system comprises means for accomplishing the injection of a spray of aqueous liquid mist to at least one point in the air intake duct (2) depending on the load and/or speed of rotation and/or temperature of the engine.
2. Water spraying system according to claim 1, characterized in that the amount of aqueous liquid to be sprayed into the air intake duct (2) is distributed in the system to several nozzles (9, 10, 11, 12, 13).
3. Water spraying system according to claim 1 or 2, characterized in that the amount of aqueous liquid to be sprayed is distributed in the air intake duct (2) over a larger area to achieve an optimal vaporization, preferably to points with a high temperature and/or air flow or to their vicinity.
4. Water spraying system according to any one of claims 1 – 3, characterized in that the number of nozzles (9, 10, 11, 12, 13) in the system is adapted according to the required amount of liquid to be sprayed.
5. System according any one of claims 1 – 4, characterized in that the point of injection and/or direction of injection of the spray of liquid mist is adapted according to the required amount of aqueous liquid to be sprayed.
6. System according any one of claims 1 – 5, characterized in that the system comprises nozzles (9, 10, 11, 12, 13) having different properties, the number and/or type of nozzles spraying being varied according to the amount of liquid required.

7. System according any one of claims 1 – 6, characterized in that the several nozzles (9 – 13) in the system are arranged on the same mounting frame (6, 7).
- 5 8. System according any one of claims 1 – 7, characterized in that the system comprises a regulating apparatus, by means of which the injection action of at least some of the nozzles (9 – 13) can be controlled.
- 10 9. System according any one of claims 1 – 8, characterized in that the system comprises at least one valve element (13, 14), by means of which the liquid flow passage leading to one of the nozzles (9 – 13) is adjusted and/or opened/closed.
- 15 10. System according any one of claims 1 – 9, characterized in that the system comprises a regulating system, by means of which the pressure in at least one supply pipe (17) leading to the nozzles is kept at least nearly constant or at a predetermined level independently of the output of the pump.
- 20 11. System according any one of claims 1 – 10, characterized in that the system comprises an output regulating pump unit, by means of which the pressure is regulated by pressure control so that the pressure in at least one supply pipe (17) leading to a nozzle is constant.
- 25 12. System according any one of claims 1 – 10, characterized in that the system comprises a control system comprising a constant-output pump and controlling the pressure by means of a valve system to maintain a constant pressure in at least one supply pipe leading to a nozzle.
- 30 13. System according any one of claims 1 – 12, characterized in that the system further comprises a system for cleaning the nozzles and/or keeping the nozzles clean.
- 35 14. System according any one of claims 1 – 13, characterized in that the pressure in the liquid supply piping is 10 – 300 bar.

- ART 34 AMDT*
- 15. System according any one of claims 1 – 14, characterized in that the droplet size of the water mist is typically below 200 micrometers.
 - 5 16. System according any one of claims 1 – 15, characterized in that a second pressure medium, typically a gas, preferably air, is supplied to at least one nozzle.
 - 10 17. Apparatus according any one of claims 1 – 16, characterized in that the apparatus comprises means for controlling the temperature of the liquid to be injected.